ABSTRACT

THESIS: The Influence of the North Atlantic Oscillation on Seasonal Snowfall Totals in the Northeastern United States, 1961-2010

STUDENT: Holly M. Widen

DEGREE: Master of Science

COLLEGE: Sciences and Humanities

DATE: July, 2012

PAGES: 146

The North Atlantic Oscillation (NAO) is one of the main components of atmospheric circulation variability within the middle and high latitudes of the Northern Hemisphere and largely affects winter weather in northeastern United States. This study examined the most recent decadal trend of the NAO as well as its influence on snowfall totals and storm track variability in the northeast U.S. over the previous 50-year period. Previous research has indicated greater snowfall totals in the Northeast during NAO negative phases due to repeated polar outbreaks. Nonetheless, past research has also shown connections between the NAO positive phase and active winter seasons in this region. This study provides insight on how both positive and negative NAO phases can produce significant snowfall in the Northeast. Statistical and graphical analysis were completed to assess the relationship between the NAO and seasonal snowfall (NDJFM) from 1961-2010 for stations within the Northeast (Virginia to Maine). In addition, two

case studies of recent winter events with differing NAO phases were evaluated to provide insight on how both NAO phases can produce significant snowfall in the Northeast.

The statistical analysis revealed inverse relationships between the NAO negative phase and seasonal snowfall. The composite analysis indicated an average positive NAO pattern from 1961-2010, yet the NAO negative years produced higher frequency of snowfall in the Northeast. The case studies highlighted variations in storm track and snowfall distribution of the two winter events in differing phases. This study shows that snowfall can occur in particular regions of the Northeast regardless of the NAO phase which has important implications for forecasters. This research also provides the necessary information to complete the most recent decadal trend of the NAO and determine its average pattern. The update of this record will assist climatologists and weather forecasters in predicting future northeast U.S. winter storms.